INFORMATION REPORT INFORMATION REPORT

CENTRAL INTELLIGENCE AGENCY

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COUNTRY USSR

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SOURCE EVALUATIONS ARE DEFINITIVE. APPRAISAL OF CONTENT IS TENTATIVE

2. Attachment 1 contains information on the following aspects of steel development in the USSR: vacuum process steel, mechanical testing, and alloy development.

3. Soviet development in the field of iron making is discussed in attachment 2, which contains information on the following subjects: blast furnaces, continuous casting, and tin coating.

ENCLOSURE ATTACHED PLEASE ROUTE

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STATE	x	ARMY	x	NAVY	x	AIR	x	FBI		AEC		ORR/Ev	x		

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RUSSIA 50X1-HUM

Economic

Iron and Steel Research Development (Metallurgy) 50X1-HUM

[redacted]

1. Vacuum Process Steel.

There appear to be major developments in both vacuum melting and vacuum casting in Russia. Probably the greatest development is in vacuum casting where [redacted] 10 installations with capacities up to 50 tons each are in 50X1-HUM operation in Russia for the production of silicon transformer steels and aircraft grade steels. These all appear to be simple ladle de-gassing processes and 50X1-HUM apparently they are convinced of the merit of such treatments. [redacted] the total steel weight vacuum-treated annually is 200,000 tons. It is well known that Samarin has been active in this field and consequently there has been a large amount of research work carried out in the Baikov Institute, and probably the largest tonnage of steel made is of silicon transformed steel. Both at the Baikov Institute and at Tsniichermet there are arc vacuum melting units of 22" dia. where the major interest has been in the production of ball bearing steels. Both of these Institutes claim to have demonstrated the superiority of vacuum-melted steel for this application, but [redacted] commercial production could not 50X1-HUM yet be justified commercially. The steels used are 1% C 1½% Cr, with an addition of ½% Si, ½% Mn for large bearing sizes. At Tsniichermet they have arrangements where steels are made and processed for sale and certainly some of this steel has been made into bearings. No results were available.

2. Mechanical Testing.

Research relating to high temperature tests in tensile machines and to creep tests is probably being conducted at the Moscow Aviation Institute. The interests of Tsniichermet on the other hand are predominantly [redacted] 50X1-HUM reinforcing steels and precision steels, such as steels for particular magnetic properties.

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In contrast

Attachment [redacted]

In contrast, the interests at the Baikov Institute are mainly connected with Nickel, titanium and niobium base alloys. Here there appears to be a large amount of work on binary and ternary alloy systems and a lot of the creep testing work was of a sorting nature using the centrifugal test machine designed by Professor Tornilov. Apart from these creep machines all the other creep machines were of the standard high sensitivity type [redacted] 50X1-HUM

[redacted] there are only 800 to 1000 creep machines in Russia. There were approximately 150 creep machines both at Tsniichermet and the Baikov Institute. The Majority of these were for operating temperatures up to 850 to 900°C but there were three special machines for use at 1200°C. [redacted] more of these high temperature machines were under construction. 50X1-HUM

There appeared to be quite a large amount of fatigue testing using large pulsating machines which were of 100(±15), 200(±50) and 600(±75) tons capacity. On these machines high temperature furnaces could be installed for high temperature operation. There was one machine of 30 tons capacity where the complete machine was enclosed in a furnace. It is of interest that all these machines were manufactured by Schopper of Leipzig.

3. Alloy Development

As mentioned above there is a lot of work being done on nickel base precipitation hardening alloys and this work extends to detailed studies of the mechanism. [redacted] they have not yet developed electron microscope techniques [redacted] 50X1-HUM

Similar stages were also being made of tempering processes in alloy steels. [redacted] Professor Tornilov [redacted] was using a combination of techniques such as hot hardness and centrifugal fatigue testing to obtain preliminary information on a very extensive range of alloys. 50X1-HUM

There appeared to be considerable interest in the powder

Attachment 1 [redacted] 50X1-HUM

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metallurgy of titanium and the main object of this appeared to be to use the product from the electrolytic extraction process which is operating on a pilot scale at Tsniichermet. The scale is large enough to produce sintered billets 400 mm in diameter from which sheet and other products were being produced in their own factory. [redacted] 50X1-HUM electrolytic processes would compare favourably with the Kroll process.

[redacted] 50X1-HUM they had attempted to make steels of the Armco 17/7 type without success. Apparently the trouble was due to lack of reproducibility in tensile properties. [redacted] 50X1-HUM [redacted] on the subject of alloy development [redacted] the relative cost of alloying elements is different, making molybdenum extremely expensive. Quite a lot of [redacted] work is therefore aimed at producing 50X1-HUM substitute alloy steels utilising tungsten and vanadium to a large extent and reducing molybdenum and cobalt.

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Attachment 3

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2. Blast Furnaces

(a) None are fully automatic. Automation is employed but no furnaces could be considered 75% automatic. The fully automatic blast furnace, i.e. one which will operate itself entirely, is some way off, but considerable efforts in this direction are being made:

(i) on the instrumentation side by TSLA (The Central Body for Automation), and

(ii) on the process side by TSNIICHERMET (Central Research Institute for Ferrous Metallurgy).

Though scale-car operation has been made fully automatic at the Kuznetsk Metallurgical Plant, it is probable that in future Works a different system of charging will be adopted. This will be easier to make fully automatic. A conveyor/skip system is being considered.

(b) Furnace operations at the Orsk Khalilovo Works present difficulties due to the highly siliceous and high gangue nature of the ores as well as to their chromium and nickel contents

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Attachment 2 [redacted]

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[redacted] 50X1-HUM

(c) There is not enough experience on the use of oxygenated blast for steel-making production to be able to say whether a 25% oxygen content led to a 25% production increase. The tests at Nova Tula, where some tests were made, are not really applicable to modern practice because of the small size of the furnace and the poor quality of the raw materials. At this Works, however, ferro-manganese production has doubled by the use of a 32% oxygen content. This large increase is, however, undoubtedly due to the beneficial action of oxygenation on coke rate. There is no reason to expect such figures for steel-making pig iron production.

In tests on the large furnace at the Nizhne-Tagil Combine, 24% was the highest oxygenation achieved and this gave a productivity increase of the order of 8% for steel making iron.

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In general, [redacted] production for ferro-manganese might be increased by 25% with a 25% oxygen content but this figure was too high for ordinary pig iron.

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(d) A 1719 m^3 blast furnace is in operation at Krivoi Rog. [redacted] a utilisation figure equal to 0.7 could be considered as reasonable for "Southern practice"; thus a 1719 m^3 blast furnace should give a daily production of 2450 tons. [redacted] however, that better figures would very likely [redacted] be obtained. For instance, at Chelyabinsk, another furnace of equal capacity will shortly be blown in and production from this furnace is estimated at 2650 tons per day.

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(e) Top blowing processes at TSLA are described in "STAL" 1957, No.8, pages 693 - 700. [redacted]

These top blowing processes have been adopted at the Petrovskii and Krivoi Rog Works.

(f) [redacted] the converter shop at the Orsk Khalilovo Plant used Bessemer converters.

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[redacted]

Attachment 2

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3. Continuous Casting

(a) A new large plant is building at Stalino in the Donbas.

(b) [redacted] a new project for a 250 ton continuous casting plant [redacted] will have an 8-strand machine [redacted]

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(c) Soviet industry is mainly interested in continuous casting because of the rapid expansion of the Soviet steel industry. [redacted] economies in a rapidly expanding industry could be effected by the saving of primary mill construction due to the introduction of continuous casting. [redacted] continuous casting was far more flexible than conventional methods. [redacted] given the present rate of research and development enough experience will have been accumulated by 1962 for a decision to be made as to whether primary rolling could safely be abandoned in favour of continuous casting techniques.

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4. Tin Coating

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[redacted] tin was relatively plentiful in the U.S.S.R. [redacted] also [redacted] it was expensive: hence the need to economise in its use. From [redacted] ambiguities between relative plenty and expense, [redacted] economies in the use of tin might be caused by the desire of the State to have large quantities available for export.

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[redacted]